UNIVERSITY OF PENNSYLVANIA

Mental Tests for Pre-School Children

DOROTHY KERN HALLOWELL

A THESIS
IN PSYCHOLOGY

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY

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MENTAL TESTS FOR PRE-SCHOOL CHILDREN

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Introduction

It is not surprising that the earliest efforts of the clinical psychologists should have centered around the school age groups. When children begin school they enter upon a new and distinct phase of competitive achievement. They are then pitted against not only a class of fellow pupils of similar age, but also are judged by the accumulative school standards of what the six-year-old should be able to master. From this point on, through their school careers, children are expected to conform more or less acceptably to specific standards in order to maintain their scholastic status. School failures being suggestive to the teacher of limited or one-sided mental development, the aid of the psychologist has frequently been sought to help understand and readjust school misfits. Hence, for the past thirty years, the clinician has been working on these problems, devising and redevising tests, accumulating and evaluating norms. We have had, therefore, at our command for a number of years, a goodly range of equipment from which to select material for a psychological evaluation of individuals from five or six years up through adulthood.

With pre-school children, the problem is quite different. Their successes and failures are not being measured so accurately. They are not competitors against their age mates in anything like as definite a way as when their school careers begin, and the need of scientifically studying their mental development has not, until very recently, been considered an important field of research.

At best, pre-school children have been compared with their few immediate associates—neighbors or relatives—in accomplishments such as walking, talking and play activities. The parent's perspective on what is normal baby development, is necessarily limited, and it does not need, in the average case, to be otherwise. However, in certain social situations, there is a demand for very care-

ful judgment of mental potentialities. Especially pertinent is the problem of the socially dependent baby, who is to be legally adopted. In the past, even as recently as four or five years ago, adoption plans were practically all effected solely on the basis of physical and social studies. But with mental tests for the pre-school age ever increasing, no social agency can well ignore the aid from psychological tests. Only those who have seen at first hand the acute disappointment which the wrong adoption brings to foster parents, and the harm which also comes to the adopted child, can sense the importance of this problem.

Tests for pre-school children have, of course, a much wider application than their use in the process of adoption. As a preliminary step in dealing with the behavior problems familiar to mental hygiene clinics, psychological studies of even such young children can be of great aid. Much time and effort can often be saved by determining at the earliest possible moment whether unsocial habits are engrafted on a good mentality, or on an inferior one.

The progressive pediatrician is continually correlating mental with physical development. The age of sitting up, standing, walking, and talking, are all dependent on both physical and mental condition. If the appearance of any of these accomplishments is delayed, a psychological study can often reveal whether in other directions there is subnormal mental functioning, and also what is the degree of retardation.

Since pre-school tests have such wide possibilities for service, it seems that study in this direction should be extensive and varied. Therefore, although a number of excellent contributions have already been made in the field of pre-school tests, the writer feels that it is still a very worthwhile subject for additional research.

PRESENT STATUS OF TEST MATERIAL FOR THE PRE-SCHOOL CHILD

When this study was begun in 1923, the Kuhlmann tests were the only guide for a psychological study of a child under three years. An interesting beginning was made by these pioneer tests, but particularly from twelve months to three years they left much to be desired, as the range of abilities tested was too limited and too dependent on specific training.

Gesell's excellent book, *The Mental Development of the Pre-School Child* (1925), added much to the psychologist's equipment. Especially from four to twelve months is the material very valuable,

and at the higher levels also if one happens to be testing a child at exactly the ages where the norms are applicable, as eighteen, twenty-four or thirty-six months. If the subject, however, happens to fall between these points, as for instance twenty-one or thirty months, judgments based upon these tests cannot be so exact.

Stutsman's monograph (1926) contains some very interesting performance tests. She does not, however, include any children below eighteen months, and the fact that her results are reported only by half yearly periods, is somewhat of a disadvantage.

Baldwin's study is also suggestive to the psychologist interested in tests for the younger ages.

Case Material Used

We will now proceed to our own pre-school study, showing the sources from which the children came, the test material used and the results obtained.

The writer believes that a series of norms to be representative of a cross section of a given population, and therefore valid for classifying the mental ability of any particular individual, should include children from different economic classes, and from different racial and nationality groups. This was kept in mind when cases were sought for study. At the same time it is, of course, difficult to determine exactly what percentage of the different groups should theoretically be included. Practical exigencies in obtaining case material are also a limiting factor of no small importance. But the writer believes that the group of 650 children tested will, in a general way, be found to be a fairly representative sampling of an urban population.

Twenty-five per cent of the cases were secured through *private sources,* representing homes of a fairly high intellectual level, one or both parents usually being college graduates. Aside from the probability of a good mentality, through inheritance, these children had material advantages, such as good housing conditions, proper diet and clothing, and medical care when necessary. The child was subjected to ample play material and considerable adult stimulation. We should expect this group to be reacting to their environment at the maximum of their potentialities. A few of this group were, in addition to home stimulation, having the benefit of nursery school training. A few negroes are in this series, but the large proportion are white and all are of American parentage.

The other *75 per cent* of the group were obtained through *social agencies,* though the reason for contact with the agency was by no means always financial dependence. For instance, *11 per cent* came through a *"well clinic"* of a large babies hospital and through a city health center. These families were practically all on a self-supporting basis. Though they were a non-intellectual group, occupied at work such as small store-keeper, tailor, chef, shoemaker, factory worker or laborer, they do not represent a depressed economic group. Their children were mostly well clothed and fed, medically cared for, their homes, though often small, were usually clean. The majority of these parents were foreign born.

Twenty-three per cent of these cases were examined at fifteen *day nurseries,* a connection which probably implies a semi-dependent financial status. Some of the fathers were dead, but more usually both parents were living and working. Most of them were employed in industrial plants, though some were clerks, domestic servants, or laborers. The fact that the mothers of these children were employed all day, necessitated a minimum of attention to home standards. The day nursery, since it had the child from ten to twelve hours a day, could, however, largely offset the lack of home care, by their attention to health, cleanliness, diet, rest and supervised play. These children are about equally divided between the white and colored, American and foreign born.

Eleven per cent of the cases were from three different *institutions* caring for white children of either American or foreign parentage. A problem produced by illegitimacy, by ill health, inadequate care, desertion or death of one or both parents, made the placement of the baby necessary. Though adequate standards of diet and health were maintained by the institutions, these children undoubtedly received less stimulation to mental and physical activity than any of the other groups. The institutional staff was usually over-worked or untrained or both, so that the minimum of play material was supplied and practically no individual help or encouragement was given for exploring their environment. These conditions might readily produce a stunted development.

The other *30 per cent* of the cases secured through social agencies were from two *child placing agencies.** The reason for care by

* I am indebted to the Children's Aid Society of Pennsylvania, for their vision in making possible the major part of this research, and especially to Dr. Jessie Taft, the Director of their Child Study Department, who was largely responsible for the initiation of the study.

these two agencies would parallel that of the institutions, meaning a similar social status. Although the facilities for individualization by the foster homes were good, many times a child was still handicapped in his fullest development by a previous unstable home care or actual neglect.

Those who have not had actual experience with individual children from various social groups may be inclined to think that in this study there are too many cases from social agencies, which may imply a poor quality of mental equipment. In looking very carefully over the individual diagnoses, this implication is not found to be true. Among the brightest children tested were a Polish boy and a colored girl from day nurseries. Nor were these exceptional cases. Many very bright children, especially Jewish, came through the Babies' Hospital. On the other hand, an intellectual parentage does not necessarily imply that a child will be above average, and this was found to be true in many of the 25 per cent of cases from private sources. In general, the writer can state that from the standpoint of the case material obtained in this piece of research, that the economic, racial or nationality status has no bearing on the mentality which we can expect in any individual case.

The writer realizes the difficulties involved in making an accurate racial classification if we attempt to set up certain criteria for physical traits, such as skin color, nose width, type of hair, etc. Not only is it impractical in such a study as this to make the actual anthropometric measurements, but even if we did, there might still be as much doubt as to just what degree and combination of darkness, hair kinkiness, or nose flatness should constitute a negro. Therefore, in this study, the grouping of white or negro was made according to the lay standard of social acceptance. Only in one case, however, were the physical traits not pronounced enough for a possible question to have been raised as to racial classification. *Fifiteen per cent* were *negroes;* 85 per cent white.

Although we are all familiar with the different cultural standards in recreation, discipline, diet and dress, which are apparent in homes of varying nationalities, it does not seem to the writer that at present we can assume that there is any significance to such differences in relation to the degree of mentality exhibited. At least, for the purpose of this study, the only bearing that another nationality seems to have, is the foreign language which the child hears exclusively, or along with his learning of English. This would especially affect the verbal tests, but should not influence

performance test results. For those who are interested in the foreign *nationalities contributing* to this study, we can say that Italians lead, with Polish, and Russians next, and an occasional Greek, French, Armenian and Spanish.

Six hundred and fifty-seven cases were personally examined, the ages ranging from twelve months to forty-seven months. To gain familiarity with younger babies and how their reactions differ from older children, about 100 cases under twelve months were tested by the Kuhlmann and Gesell standards. No babies, however, under twelve months appear in this study, as they are too immature for the performance tests to mean anything except something to grab, throw around, or put in the mouth. Four 11 month babies, who by other tests appeared average, were given the 3 Disc Formboard and Peg Board A, with entirely negative results.

On all the tables *12 months means* from the day the child becomes 12 months old until the day before he is 13 months old. When norms are being presented in bimonthly periods, a child can be compared by this calculation just as accurately as if 12 months means from 11½ to 12½ months, and it seems much easier to compute any monthly age by using actual chronological dates than by counting back half a month to find in which group he belongs.

	No. Cases		*No. Cases*		*No. Cases*
12 m.	14	2	16	3	23
13 m.	17	2:1	21	3:1	13
14 m.	13	2:2	25	3:2	23
15 m.	13	2:3	28	3:3	21
16 m.	18	2:4	23	3:4	14
17 m.	16	2:5	19	3:5	16
18 m.	20	2:6	27	3:6	14
19 m.	18	2:7	22	3:7	19
20 m.	18	2:8	19	3:8	14
21 m.	17	2:9	15	3:9	17
22 m.	17	2:10	15	3:10	15
23 m.	20	2:11	20	3:11	17
Total	201	Total	250	Total	206

Anyone who has observed a child's development, even apart from test responses, knows the very rapid advance that is made month by month. For this reason it seems highly desirable to report all the results in as small groups as the entire number of cases warrants. Therefore, bimonthly norms are being used as the age group against which any one individual may be compared.

The number of cases for all the tables is not the same, as some of the tests were added later in the study, and also, because of difficulty, some of the tests were not even presented to certain children at some ages.

The *sex distribution* is not quite even, 56 per cent boys, 44 per cent girls, but for practical purposes this seems satisfactory. The results are not being reported by boys and girls separately, as the groups, being arranged bimonthly, would be too small, and from reported studies, sex differences are on the whole small or entirely insignificant.

A most important question in making a group of representative norms is the *quality of the cases* included. Should the cases all be within the average range, thereby rejecting all feeble-minded as well as superior children. It seems to the writer that the first important criterion of acceptance is good physical condition. This was controlled in many cases by a medical examination immediately preceding the psychological study, or by observation of trained nurses. If there was any question of a possible illness, the examination was postponed, or if made, the results were discarded in making up these norms. The question of rachitic children is at point. The writer has not seen reported any studies showing the relation in this disease between mental and physical retardation. However, of some twenty rachitic children examined, all were mentally retarded, many even appearing to belong in the definitely feeble-minded group, and because they definitely were below par on the physical scale, it seemed better to discard these results from the group study.

Assuming then, that, as far as we could know, the cases were physically well at the time of examination, are we justified in including all of them in a representative group? It seems to the writer, that if a child has not been socially excluded from his group, that is, if he is accepted on a par with other children, to partake of the same opportunities, and if he is not singled out for any special treatment, he can legitimately be included. In any individual study we want to know how a child measures up to his whole age group, and his age group might well have an occasional feebleminded or superior child in it.

Another question which might be raised is the validity of including retested children in the norms. If a retest is not given too soon after an initial examination, it seems justifiable. For instance, a twelve months baby may be retested at sixteen or eighteen

months. The probability of the familiarity with the material from the first examination influencing the second one is very slight. The time interval between the tests is frequently such that entirely new tests are given. For instance, at fourteen months the 3 Disc Formboard and Peg Board A are used, while at twenty-two months, the 3 Figure Formboard, Peg Board B and Colors would be added.

Unless a child was very resistant to the examination, results have been included, though retests have at times shown the first examination was not representative. A marked shyness or other emotional condition may give poorer results than the child is really capable of, but if the behavior is not abnormal with the refusal to work, crying or temper tantrums, how can we know without retests that a particular examination is valid? This problem does, of course, make tests of young children less dependable than of older children, but of this more will be said later.

In making an individual study it is always necessary to secure a careful history, so as to have an adequate understanding of the child as we see him. This was not feasible for the group of 657 cases examined, but for every child except a few foundlings, we had the correct birthdate, sex, color, nationality and general physical condition. In addition, the child was usually well enough known to some responsible adult, so that if any outstanding difficulty in behavior, habit training or development existed, we were told of it. Significant facts in heredity could usually be gotten. Eight foundlings are included in this study, for whom no history whatever was procurable. The birthdates were assigned by a physician according to physical maturity.

Test Material Used

Formboards at any age level, and particularly for the preschool child, lend themselves well for psychological study. They are largely self-explanatory, which puts the foreign speaking child or the "late talking" child at no particular disadvantage. They negate as nearly as possible the training factor. Although general experiences with certain kinds of toys may give some children a slight advantage, the formboards themselves are a new problem to any child. Their resemblance to games makes them readily appealing, especially to young children. Self-consciousness which is so often evident when verbal responses are required, is not a deterring factor with concrete material. An uneasy attitude many times completely vanishes as soon as the child begins to do something with his hands.

With new material of the performance type, opportunity is given to study the rapidity with which new associations can be built up, which is, of course, the whole problem for learning. Also, when a child is actually at work on a given test, many attitudes and methods of approach can be observed, which are a good index to future competency.

Because of all these general advantages from the presentation of performance test material, the writer was interested to secure a battery of tests of increasing difficulty for the ages of one to four, and to present them to a sufficiently large group to obtain bi-monthly norms.

The material selected for standardization was not newly devised for this study. The Psychological Clinic at the University of Pennsylvania has for a number of years had several very simple block tests which were used chiefly for feeble-minded children, who were unable to do the more difficult standardized tests. No one had any definite knowledge as to what normal youngsters could do with them, so it was thought these 3 Disc and 3 Figure Formboards would be well worth standardizing. Very soon afterwards, the Wallin Peg Boards, Series A, B, C and D, and the Witmer Formboard were added to the battery of tests. In addition to the performance tests, color cubes were used for the detection of color discrimination and the audito vocal digit memory span was obtained when possible, either as a test by itself, or as one of the Binet tests. Under method of procedure, complete descriptions of the above mentioned tests will be given.

The writer wants to make clear to any interested in using pre-school tests, that she does not feel this battery of tests should be the only material used for a complete individual study. Especially now with the Gesell and Stutsman norms available, they should be supplemented whenever possible. Also, when there is a language development, we should not neglect to use verbal tests, such as the Binet. Particularly from 12 to 18 months, this battery is an incomplete gauge, for if interest in the 3 Disc Formboard, and Pegs A and B fails, which are the only performance material simple enough for so young a child, there is nothing else in the series by which to evaluate mental development.

General Method of Procedure

The general conditions applying to all clinical psychology held in this study except that with a large proportion of the cases the

testing was done, not in a strange laboratory, but in a place where the babies felt at home—in their own houses, or, with the social agency cases, in the nursery where they habitually spent a large part of their time. A quiet room, made as attractive as possible, was used and only those who had a definite relation to the work of the experiments were present, that is the child, the examiner, and frequently the mother or other familiar adult. In many cases, the presence of the mother or caretaker was essential to reassure the child and to help overcome the timidity and shyness which the strange situation and the examiner produced. Particularly with one- and two-year-olds did I feel that we could be more sure of the best display of ability if a familiar person was allowed to stay with the child. Of course, the disadvantage to this was the aid which it was hard for the mother to resist giving. But except in a few unusual cases, caution against this prevented spoiling of the results.

In planning for a test, an hour was allowed, though frequently less time was needed if co-operation of the child could be secured. Of course, all this period was not consumed with the actual testing, for often considerable time had to be spent making the right approach and building up rapport between examiner and child, and there were distractions and times when free play had to be allowed. The older the subject, obviously the easier it was to get conformity to the test situation. The aim was for the child to be as free and spontaneous as possible, and have, not a feeling for the artificial conditions set up, but a natural play attitude. Often extreme patience was required on the part of the examiner. Ingenuity, indirect methods, persuasion and encouragement needed to be used much more than with the average older child. Although there was a routine procedure for each given test, still the examiner had to have a flexibility of approach to suit the individual case.

Small children are so continuously active that the examiner must always anticipate them and see that they are constantly supplied with material to hold their interest and attention. When verbal tests are used, they must be introduced between the concrete ones, for the child will become very impatient, restless and disinterested if many questions, such as the Binet, are presented for even a short period of time, to say nothing of the self-consciousness that with some children appears as soon as their ability takes a conscious verbal form. Therefore, in presenting the series of tests, a uniform order, though desirable, could not always be followed. It was essential, however, to see that the simplest material was given first.

It is fatal to many children and immediately destroys all interest, if they have no sense of achievement. Though they are failing, enough encouragement and praise must be given to offset discouragement and even to make them unaware of their failure. When encouragement must be given, it should be indirectly, by the examiner's attitudes rather than by any definite assistance. If too much help is given, it does not make an individual test result representative of that age and justly comparable to results with the same material given to older children.

When possible, the order of presentation was 3 Disc Formboard, 3 Figure Formboard, Witmer Formboard, Pegs A, B, C, D, Color Matching and Memory Span. When it was seen that a certain test was beyond the ability, still harder ones were not given. Tests such as the Binet and the Gesell were interspersed for diversity or because it was known that many language tests could never be given together.

In evaluating individual responses for diagnostic purposes, a most essential factor to be kept in mind is the interest element of the child. Especially with children under eighteen months, attention to a set task is at times very difficult to secure and hold, and failure to do a test does not necessarily mean inability to do it. We must also continually keep in mind the fact that innate intelligence, personality and general training all have an influence on responses to the tests, and the three are so closely interwoven that many times we cannot separate the effects which are due to each. Therefore, although we are required, in making up a series of norms to take results as we obtain them, in an individual case the response may not be an index to potential ability.

Individual Tests—Description, Presentation, Scoring and Discussion

three disc formboard*

Description. This board is of wood, 8¾ inches long by 4¼ inches wide, with three recesses ¼ inch deep and ¾ inch apart, into which fit round wooden blocks, each 1¾ inches in diameter, and 7/16 inch thick.

Presentation. The board is placed on a table in front of the child, the long edge parallel to the table edge, and with the three blocks in their recesses. As soon as the child's attention is on the

* The Three Disc, Three Figure, and Witmer Formboards can be purchased from the Psychological Clinic Laboratory, University of Pennsylvania.

formboard, the blocks are removed one at a time and placed on the table between the board and the table edge, in one pile in front of middle recess. Then examiner says, "put the blocks back." If the child does not seem to understand the verbal directions, motion. If still the child does not replace the blocks in the three holes, repeat the directions. If the blocks are not yet replaced, begin teaching, taking the baby's hand, putting it on the block and directing it to the hole. If necessary, repeat for the other two blocks until all three are in. Count this as one teaching trial, and then say, "put the blocks back again." If necessary use ten teaching trials.

THREE DISC FORMBOARD
(199 cases)

Age	1–1:1	1:2–1:3	1:4–1:5	1:6–1:7	1:8–1:9	1:10–1:11
Deciles						
100	L^2	L^1	S	S	S	S
90	L^2	L^1	S	S	S	S
80	DNC	L^2	L^1	S	S	S
70	DNC	DNC	L^1	S	S	S
60	DNC	DNC	L^1	S	S	S
50	DNC	DNC	L^2	S	S	S
40	DNC	DNC	L^2	L^1	S	S
30	DNC	DNC	L^2	L^2	S	S
20	DNC	DNC	DNC	DNC	L^1	L^1
10	F	DNC	DNC	DNC	L^2	L^1
0	F	F	DNC	DNC	DNC	L^2
%S	0	0	9	57	77	72
%L^1	0	8	33	16	9	22
%L^2	10	15	29	5	5	6
%DNC	74	69	29	22	9	0
%F	16	8	0	0	0	0
No. of Cases	31	26	34	37	35	36

Scoring. Success, learning, did not complete, or failure, is the recorded qualitative performance. Success (S) in the norms means immediate success on first two trials with no help given. Learning (L) means success after teaching—L^1, success after one to five teachings; L^2, success after six to ten teachings. Did not complete (DNC) means the three discs were not all replaced after ten teaching trials, but single blocks were put in unaided. A block may be considered replaced if it is more than half-way in the hole. Failure

(F) means no blocks at all were put in on any of the ten teaching trials. The time element is not considered except in a general way, as rapid, slow or very slow. Record carefully how the test is done —for example, "first trial, all in"; "first trial, two in, third on top of second"; "second trial, one in, throws others around"; "sixth trial, still gets no idea of putting in."

Discussion. Qualitatively there are four distinct types of response to this simple formboard. There is the child who immediately understands the problem of the test and solves it, which is *success.* No individual under sixteen months succeeded and the fact that at sixteen months only 9 per cent did succeed would seem to indicate a superior intelligence at this age. From eighteen months on more than half will succeed, so that the test then becomes less significant for the selection of the best children. We must, however, mention a response which appeared with a few cases, when the 3 Disc Formboard was not done on first trial, but only after being helped. A subsequent ability to do the 3 Figure Formboard, a much harder problem, would indicate that it was a factor other than lack of comprehension, presumably an inhibition due to shyness or self-consciousness, which gave an apparent failure. This type of thing shows what was mentioned above, that with small children especially, any individual test result can never be considered as a thing apart, but must be evaluated in light of the entire range of responses.

Although a child did not immediately comprehend the test, it seemed to be worth while to analyze other responses, and the study has demonstrated the excellence of this formboard for teaching material at lower age levels. The *learning* ability was determined through studying the number of repetitions needed before the test was solved without help. Although very few of the 16 to 17 month children will do the test on first presentation, approximately the middle 60 per cent can be taught to do it, the better half of this group after one to five teachings, and the poorer half after six to ten teachings. Only 23 per cent of the 14 to 15 month group can even do the test after teaching. Ten per cent of the 12 to 13 month babies can be taught to replace all three blocks, and even this small number required more than five teachings before solution was possible. As with other material, attitude to the tests plays an important part. The exceedingly active child whose ability and keeness may even be above normal, frequently fails to learn the test because he is too eager, reaching out for new stimuli, to fixate on this one object

long enough to learn how to do it. Because of a quieter, maybe even duller disposition, the attention of another baby can be held and the same performance will contentedly be done time after time, until it is learned. Therefore, failure after teaching, especially below the 18 months point, may readily include types of ability besides the potentially dull. Above 18 months, however, when ontogenetically more concentration on any performance is developing, failure after ten teachings has much more significance.

Another type of response, not either success or learning, is DNC, *did not complete,* and which I have taken to describe the performance where there is some comprehension of the problem and one or two blocks are understandingly placed back in their holes. Particularly in the group under sixteen months is this response common. It surely means something to get evidence of an association being built up between the block and the hole sufficient for single blocks to be purposefully replaced, even if the entire board is not solved. It is apparently an undeveloped spread of attention, a trait of immaturity whereby the baby puts in one or two blocks, takes them out again, puts them back again, but always fails to put in all three. It is as if the third hole were out of their field of vision.

The most immature and inferior type of response is complete *failure*—even after teaching, no blocks are replaced. The baby may ignore them, put them in his mouth, throw them on the floor, or hammer them together. At least, no evidence can be obtained for thinking that a learning in relation to this problem is taking place. Of course, we must remember that again it may be lack of interest at the attempt to teach, which gives the failure.

THREE FIGURE FORMBOARD

Description. This board is also of wood, the same size and general construction as the 3 Disc Formboard, only instead of there being 3 circle blocks, there are in order, a circle, an equilateral triangle and a square.

Presentation. Place the board on the table with the long edge parallel to the table edge, with the blocks in their recesses and the circle at the child's right. For convenience call circle, block 1; triangle, block 2, square, block 3. Remove the blocks, while the child is attending and place in one pile directly in front of triangle recess, in order 1, 3, 2, circle on top. Examiner then says, "put the circle back." If the child seems to be trying, allow even several

minutes of independent effort, then, if incorrect, teach the correct placements. "Put the blocks back again," and for the second trial, vary the order of the pile to 3, 1, 2, square on top. After each failure, teach, and then have a retrial. Third trial, order 2, 3, 1. Fourth trial, same as first 1, 3, 2. Fifth trial, same as second, 3, 1, 2, etc. After two consecutive correct trials, reverse the board to

position B with the circle at the child's left. This is done to vary the problem and negate chance successes. It is noted that the order of piled blocks is never the same as the order of the holes in the board. Allow ten teaching trials if necessary.

Scoring. To obviate chance fitting in of the blocks, which by the law of probability works out to three consecutive trials, require two correct trials in position A, and the next immediate one in position B, or vice versa, two in position B, one in position A. Success (S), therefore, means success on the first three consecutive trials, two in position A, one in position B, or vice versa. Learning (L) means success on three consecutive trials, but after teaching. Did not complete (DNC) means out of ten trials with teaching, a failure to replace the three blocks correctly in three consecutive trials. The time element is not considered, but the qualitative performance is recorded—for example, all correctly in, position A, trial and error placements; one and three incorrect, position B; all correctly in, position B, form discrimination used in placements. Count as correct if all but one block is correctly set in, and this third one at least half-way in, and over its hole in the proper position. Because of difficult co-ordination, the square or triangle may be hard for the younger children to replace.

Discussion. Obviously, the 3 Figure Formboard is a task considerably harder than the 3 Disc Formboard. It is an excellent test for the study of the appearance of form discrimination. Better developed motor co-ordination is required to fit in the square and the triangle than the circles of the 3 Disc Board. Since each block can only go in its own hole, the problem becomes almost a triple intelligence test, and before discrimination for the different shapes is developed, trial and error, which is a changeability in response, is needed for the solution. It is only the very young or the dull

child who will interminably continue to try and force a square block into a round hole, and it is the better mind which will sooner think of some other plan to try. As the table of norms shows, quality of performance correlates well with age progression. Below 18 months all responses were failures. At 18 to 19 months, the earliest age where the three blocks were fitted in on any three consecutive tests, the solution, even for the best 11 per cent, was only after a teaching period and was entirely by trial and error. By 24 months more than half of the children will learn the solution and from this age on, the number who get the idea of the test without teaching gradually increases until at two years, 6 months, the better half succeed and the poorer half require teaching or fail. For three-year-olds, the test has little value, except as introductory to the Witmer Formboard. Not until 22 and 23 months did any performance reveal distinctly more discrimination than trial and error for its solution. Discriminative placements increase then very gradually, until by 36 months the successful responses are either entirely or predominately not trial and error. Only four out of 201 three-year-olds failed to do this test after teaching—one because of attitude, as later success with the Witmer Formboard proved, and the other three distinctly inferior children, and most probably feeble-minded. None of the three failures was absolute either, as all occasionally got the three blocks in and it might possibly have been faulty attention or shifting interest which prevented success on three consecutive trials. With the younger children, failure often meant a different thing, no comprehension and all or some of the blocks left lying over the wrong holes—the idea of solving by trial and error could not be learned. So we see that even DNC has its qualitative aspects which should, in an individual response, be carefully noted.

WITMER FORMBOARD

Description. This board has eleven figures, the general size of which approximates the blocks of the 3 Disc and 3 Figure Formboards. Complete description, procedure and discussion of it will be found in Dr. Young's first standardization.

Presentation. The standard procedure of Young's should be somewhat modified for very young children. The idea of quickly or fast has practically no meaning for most children under four and often confuses them. It seems better therefore to substitue "nicely" for the words "quickly" and "fast." In the third trial, substitute "even better" for "still quicker." If more help is given

to the younger children than the older ones, it does not make the results comparable, but it does seem legitimate to urge continuance, if necessary, by saying at least several times, "put the blocks all back," instead of considering the test a failure if the additional directions, according to Young, do not bring the appropriate response.

Scoring. A five minute time limit was placed on each of three given trials. Although the norms report quantitative responses, the qualitative aspects are equally important.

Discussion. At a point where half of the cases will succeed with a given test, it becomes necessary to introduce a harder problem if we wish to differentiate the children who are above the median. Therefore the Witmer Formboard was given at the ages where success was obtained with the 3 Figure Formboard. It would be highly desirable to have a board which in difficulty lies between the 3 blocks and the 11 blocks and possibly in the near future such a test will be ready for standardization.

In general we can say that the children who will do the 3 Figure Board without teaching, will, after teaching, solve the Witmer Formboard. Success on first trial is almost negligible in the two year group and not until 3 years, 8 months, do half succeed. Below this point, the test has value for teaching purposes, and from the norms we see that, at 2 years, 10 months, almost a year below the median age for initial success, we have 54 per cent succeeding by at least the third trial.

The realization that this is a very hard task is evident apart from the statistics. Many children, discouraged or fatigued by its difficulty, push it aside long before the five minute time limit is up, and they cannot be induced to try it again. Even with the three-year-olds, some urging to keep at the task is usual. Hence we see that this test requires more persistence than any previously presented. Also a wider distribution of attention is needed. Obviously with a star and a cross to be fitted in, fairly good co-ordination and motor control must be developed, and at times a failure to get these forms in, may block the success of the test, since, after trying unsuccessfully, children will leave the correct holes and try to force the forms into others. Of course this is only the case with the more immature, for whom form recognition is not developed sufficiently to assure them that the block is correct for the particular hole. To those who have not yet acquired a visual form discrimination, kinesthesis is a great aid to correctly replacing the blocks, and with this

sensibility and sufficient persistence and some planfulness, the Formboard can be and often is solved entirely by trial and error.

Although some language comprehension is necessary to understand the initial instructions, its need is even more apparent when the test is used for the younger ages as a teaching problem. Many times we meet children who do not even understand what you mean by "try it in another hole," or, even by motioning to, do not get the changeability idea. With these same children we usually have an accompanying lack of observation and they are equally satisfied to have a block fitting in a recess or to have it lying on top of a wrong hole. It is the many psychological traits thus revealed that make this one formboard so valuable a problem even for the pre-school group.

WALLIN PEG BOARDS

Description. These pegboards, series A, B, C and D, are each 14 inches long and 3 inches wide, 6 pegs to a board, each peg 2½ inches long and with a diameter of ⅜ inch. They are figured in the catalogue of C. H. Stoelting Company, from whom they can be purchased. Series A has 6 round pegs; series B, 6 square pegs; series C, 3 round and 3 square pegs alternating; series D, 2 round, 2 square, 2 triangle pegs alternating.

Presentation Pegboard A. Place the board with the length parallel to the table edge, the pegs removed. Place the 6 pegs in a bunch at right angles to the board (so as not to roll off the table) and between the board and the table edge. Examiner then takes one peg and puts it in for the child, so that he sees what is expected. The peg is removed again and placed with the other five. "Put all the little sticks in like that." Record the time from the moment the child gets the first peg in his hand. Give no additional directions unless the child seems to play too much, loses interest or forgets the task, when it may be added once or twice, "Put all the little sticks in." Allow 3 minutes of independent effort, then if necessary complete for the child, making it a learning problem. Give 3 trials to observe the improvement, allowing 3 minutes for each. For the very young children from 12 months to about 17 months, the teaching will often take the form of guiding the hand with the peg in it to the hole, in order to see if even single pegs can be replaced.

Scoring. The results are chiefly quantitative, recorded in seconds, although observations should be made on comprehension, coordination difficulties, and any abnormalities of response. Success

(S) means 6 pegs replaced in 180 seconds or less. Did not complete (DNC) means 2 or more single pegs put in, but the board never filled up without help. Failure (F) means no single pegs put in, even after two teaching trials.

Discussion. From the viewpoint of general difficulty, Pegboard A correlates fairly well with the 3 Disc Formboard. It is much easier, however, even apart from size differences, to put in a round block than round peg. Luck assists many times in helping the block to roll in, after it is generally directed towards its hole, but to replace a peg, the hand must be definitely turned at a particular angle. It seems therefore that more developed co-ordination is needed for the Pegboard than for the 3 Disc Formboard. Though the norms report more failures with the pegs, the observation of many children really trying to insert a peg, seem to show a comprehension level about equal to that required for the 3 Disc Board when a necessary association has been built up between the block and its hole. The fact that at 12 and 13 months, 54 per cent will fail entirely with the Pegboard A, while only 16 per cent will fail with the 3 Disc Formboard, seems attributable to co-ordination difficulties rather than to degree of comprehension. Lack of persistence and distribution of attention prevents the six pegs from being inserted by at least half of the cases until 18 and 19 months, the same age at which half of the children fail to do the 3 Disc Formboard on initial presentation. The higher percentage of success with the Pegs and the 3 Disc Formboard, 81 per cent as against 57 per cent, would seem to be due to the 3 Disc Board being presented at the beginning of the examination when a self-consciousness or shyness prevented the best possible response.

Above 19 months in at least one trial there were no failures with this simplest pegboard, which therefore decreases its value except as a measure for muscular co-ordination. The completion times change quite gradually by bimonthly periods through the median deciles, and decreasingly less as the ages increase. For instance, the median time decreases from 18 months to 24 months by approximately a half minute, while through the entire 3 year group the median does not vary by more than 5 seconds, an almost negligible amount.

Presentation Pegboard B. The directions are the same as with Pegboard A. Allow 3 trials, teaching if necessary.

Scoring. Same as with Pegboard A. Time limit is 180 seconds.

Discussion. Pegboard B presents no harder a problem than series A except from the standpoint of more difficult co-ordination which in turn requires more persistence with the set task. Below 14 months not even a single square peg was inserted, and not until 20 months, did more than half succeed. The norms show, however, a considerable difference for the point where all completed the pegboards, 24 months for Pegboard A and 32 months for Pegboard B. The time range is wider than with Board A, and especially within any age group do we find more individual differences. For instance, the range at 36 months with Pegboard A is only from 12 to 36 seconds while with Pegboard B it is from 13 to 116 seconds. The higher in the age scale we go, the less does the time decrease, which therefore lessens its test value.

Presentation Pegboard C. The same procedure is used as with A and B series, but care must be taken that the pegs are definitely mixed up, and not lying on the table in an order to correspond to the order of the holes. Allow three trials, teaching if necessary after the first two failures. If however, the first two trials are failures and the third trial is a success, a fourth trial should be given.

Scoring. The test is not considered passed unless at least 2 out of 4 trials are completed in 180 seconds each. Many children by luck got the 6 pegs replaced, but could not repeat their success, and to obviate this kind of chance success, 2 trials were required. Note whether success is by apparent discrimination or by trial and error.

Discussion. With the presentation of series C, an entirely new problem is involved just as in the 3 Figure Formboard—analytic discrimination. The most superior children will solve the test without error, through form discrimination, but if form recognition is not developed, the test can however be solved by a systematic trial and error method, particularly after a teaching trial. There are often in this type of solution many useless moves made, correct pegs being changed as well as incorrect ones. The more resourceful children will shift the pegs until all fit in, while the less intelligent ones will try endlessly to force a square peg into a round hole, not thinking of trying it elsewhere. At 30 months where immediate success is median for the 3 Figure Formboard, is success obtained with the Pegboard C by 55 per cent of the cases on first trial, and 74 per cent after teaching. Solution of the 3 Figure Formboard after teaching is median for 24 months. Therefore while there are

some similarities as to abilities required, Pegboard C is the harder of the two problems.

Presentation Pegboard D. The same procedure is used as with Pegboard C. Place the board with the point of the triangle towards the child, to bring this distinguishing feature closer to his notice.

Scoring. Success means any one trial completed in 180 seconds. Allow three trials to note improvement, and teach if necessary after the first two failures.

Discussion. There are several features which make this the most difficult of the 4 pegboards. There being 3 different shapes, even more form discrimination is required than with Pegboard C, and if the solution is by trial and error, more shifting needs to be done. More mature co-ordination is required to fit in the triangle pegs than even the square ones. Many children have such a hard time trying to put in a triangle peg that they think the hole must be the incorrect one and shift it to a square hole where it will go in easily. Unless observation is keen, the chances for correcting this mistake are slight. It is obviously only the most superior children who will solve the test by real form discrimination, that is, immediately placing the right peg in the right hole. Not until 34 months do more than half of the children do this test without teaching, while after teaching, success can be carried down to 30 months.

COLOR CUBES FOR MATCHING

Description. Use Milton Bradley's one inch color cubes—5 yellow, 5 red, 5 blue, 5 green, 5 purple, 5 orange.

Presentation. Throw on the table 20 blocks, 5 each of the four primary colors. The examiner takes a yellow cube in her hand and says, "Give me one like this." If the child does not understand, examiner takes another yellow cube and placing it with the first says, "See, these are alike. Give me another one like these." Illustrate again if not understood. When a block is correctly matched, continue, saying, "Give me another one like these," until 4 out of 5 blocks are correctly matched.

Repeat the directions with the red blocks. If red and yellow are both failed, consider the test a failure. If red and yellow are matched, continue, using green, then blue. If there is any doubt as to the responses, go through the series again with the 4 primary colors, so that at least 8 out of 10 blocks will have been correctly matched. Then place the 5 orange and 5 purple blocks with the other 20, go through the entire series again, using the same directions. It is to be noted that the color names are not used.

Scoring. Failure (F) means no color matched in at least 4 out of 5 trials, or 8 out of 10 trials. Yellow (Y) means yellow blocks matched in at least 4 out of 5 trials, or 8 out of 10. Red Yellow (RY) means both red and yellow matched. Primary (P) means yellow, red, blue and green matched. Success (S) means 6 colors matched, yellow, red, blue, green, orange and purple.

Discussion. The earliest age at which color discrimination appears has been variously reported. Some writers have experimented and published results with children as young as 8 months. It seems, however, in light of this research, very doubtful whether at such an early age, the different colors actually arouse varied visual images, or whether the baby is not rather reacting to what is pretty and bright and arouses pleasure. Preyer, Shinn, Baldwin and Moore have all reported on color discrimination, but the results of their studies vary considerably. They all agree, however, that reactions to light are evident before color reactions. In previous investigations, the general methods of deciding when color images have meaning to the small child was through a pleasure preference or through giving color names for objects. Shinn says that all experiments are without conclusive evidence as to condition of color perceptions before one year, but at about 15 to 16 months is the dawn of conscious color discrimination proved through learning color names, and by the third year, or maybe the end of the second year, the child has the color discriminating ability of adults, and can be taught to discriminate and name colors perfectly.

Preyer subjected his child to a series of learning tests with color material, using 10 colors. At 25 months, or the age at which Shinn says color discrimination is as good as with adults, success with Preyer's baby was only 2 to 1. Even at 34 months, or almost the third birthday, the color naming was still only 70 per cent correct.

The difficulties with all the previous color discrimination experiments seem to be that they are too individual in nature, so that the results which held for a dozen babies, probably of superior ability, would be of little value for comparison with the average child. Also previous studies have all included the learning problem, a definite attempt had been made to teach color discrimination and color naming or the results were dependent on earlier teaching. In this study the aim was to detect the age at which the child, regardless of previous teaching, familiarity with color names, or even a comprehension of verbal instructions, could demonstrate the

presence of color discrimination by matching cubes of the same color. Color matching is an ability which ontogenetically appears, regardless of training, and the earlier it is developed, the more superior seems to be the ability of the child. Of all the battery of tests, this one seemed best to pick out the dull and feeble-minded children, for color matching cannot, like many tests, be done by trial and error or any amount of persistence, but demands actual differentiating ability.

Our results, even though the case material includes a number of young superior children, show no child under 18 months matching the cubes, while Shinn reports 15 or 16 months as the dawn period of conscious color discrimination. It is the very unusual child under 24 months who shows any success with this test, and not until 30 months do at least half of the cases reveal some degree of discriminating color ability. The norms show good curves—not only does the presence of the most rudimentary discrimination increase, but the refinement of the differentiation just as gradually develops with age.

Apart from the age at which color matching appears, our research also gives different results from those usually reported as to which color is first discriminated. It is usually claimed that red is matched before all other colors. Of 20 children who successfully matched only one color, that color, with one exception, was yellow and not red, which would seem to show yellow to be the first discriminated color. Obviously yellow and red were matched before blue and green, which, particularly for children under 3 years, were readily confused. Purple was often confused with blue or even red, and orange with yellow or red.

AUDITO-VOCAL DIGIT MEMORY SPAN

Presentation. The standard procedure was slightly modified so as to make the digit material arouse interest and so as to begin at a point as familiar as possible to the child. The examiner says, "Can you say 1, 2?" If there was no response, examiner attempted to assure the child that he could say the numbers and commendation was given for the least attempt at trying them. "Now say 6, 3." When 2 digits were correctly repeated, a series of 3 were given, then 4, and so on until the upper limit was reached. Care was taken that the series of digits never followed the natural order. The digits were pronounced at the rate of one per second, without rhythm or changing intonation in the voice.

Scoring. The memory span was taken as the highest number of digits that the child reproduced correctly in one of three trials. Failure indicated a negative response.

Discussion. Since practically nothing has been reported on memory span ability below the three year level, it seemed worth while to try and obtain some results for one- and two-year-olds. This study has shown, however, that below 30 months more than half of the responses are failures. With children under 24 months this negative response seemed to be chiefly due to limited vocabulary, and even with some older children to an unfamiliarity with the numbers themselves. A shyness at times inhibited a response, and often it appeared to be a pure disinterest in the test. By three

AUDITO-VOCAL DIGIT MEMORY SPAN
(413 Cases)

Age	1:8 1:9	1:10 1:11	2 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3: 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles														
100	3	3	3	4	4	5	5	5	4	4	5	5	5	5
90	3	2	2	3	4	4	4	4	4	4	4	4	5	5
80	F	F	F	3	3	3	3	4	4	4	4	4	4	4
70	F	F	F	3	3	3	3	3	4	4	4	4	4	4
60	F	F	F	F	2	3	3	3	3	3	3	3	3	4
50	F	F	F	F	F	2	3	3	3	3	3	3	3	4
40	F	F	F	F	F	F	3	3	3	3	3	3	3	3
30	F	F	F	F	F	F	F	2	3	3	3	3	3	3
20	F	F	F	F	F	F	F	F	3	3	2	3	3	3
10	F	F	F	F	F	F	F	F	2	2	F	F	3	2
0	F	F	F	F	F	F	F	F	F	F	F	F	F	F
No. of Cases	18	15	28	44	29	36	25	30	30	39	28	31	29	30

years most children are learning in a limited way to count three or four objects, and the test is then much easier to obtain results for. Although the percentage of failures for one- and two-year-olds is high, there is still no conclusive evidence that memory span ability at this age is lacking, even for digit material. Verbal responses for small children are so variable, that the results of an individual case might be contradicted on an almost immediate retest, or by a test given by a more familiar person, like the parent. In some cases when negative results were obtained, the test was repeated later during the course of the examination and correct re-

sponses were gotten. Hence we cannot always say which responses were due to inability, and which to lack of interest or emotional negativism.

It is interesting to find that some children, even in the 3 year group, have a 2 digit span. Of 192 two-year-olds, only 3 gave 5 digits, 20 gave 4 digits, while 3 was the mode. Even in the three year group, not until 46 months or almost the fourth birthday, do at least half of the cases give a span of 4 or more.

If time had permitted, more extensive experimentation should have been made, using memory material other than digits, and also a simple commission test.

BINET TESTS

Since the Stanford-Binet tests have aroused such universal interest, I am reporting on the responses as obtained in this study,

STANFORD-BINET RESULTS

Number and Percentage Passing Individual Tests

TEST	No. and % Passing at 2 yrs.	No. and % Passing at 3 yrs.
3–1 Face parts	124–82%	169–90%
3–2 Objects	107–71	163–87
3–6 Memory span	72–48	152–81
3–5 Last name	55–36	123–66
3–3 Pict. enum.	38–25	131–70
3–4 Sex	44–29	121–65
4–5 Comprehensions	22–14	78–42
4–6 4 Digits	21–14	69–37
4–1 Lines	15–10	72–38
4–2 Forms	4– 3	56–30
4–3 4 pennies	1– 1	29–15
5–4 Definitions	3– 2	16– 9
5–1 Weights	1– 1	16– 9
5–3 Prettier	1– 1	15– 8
7–2 Pict. descript.	1– 1	15– 8
7–3 5 digits	3– 2	11– 5
5–2 Colors	2– 2	11– 5
5–6 3 Commissions	1– 1	11– 5
4–4 Square	0	9– 4
6–1 Comprehensions	1– 1	6– 3

especially showing the order of difficulty of the individual tests. With a large group of unselected children there are instances where Binet results are not a fair index to general ability. The reasons

for this, discussed by previous investigators, were also apparent with my group. Because of a foreign language, many children were placed at a special disadvantage, probably much more so even than the older group, because our cases had not yet had the contact of English in school life. A marked self-consciousness inhibited many answers—for instance, children frequently would not point to parts of their faces, try memory tests or give their surnames, when from the information of a reliable parent, we were quite sure they could pass the tests. Still credit could not be given unless the examiner personally received a positive response. On the other hand, ambitious parents frequently teach their children the face parts, their full name and their sex, so that the Binet question is not a new problem, and such children through environmental acceleration may

Deciles of I. Q.s—Stanford Binet Tests

	2 years	3 years
100%	179	160
90	130	119
80	118	106
70	112	100
60	108	95
50	103	94
40	100	89
30	92	84
20	86	76
10	Negative	62
0	Neg. (23)	Neg. (15)
No. of Cases	150	186

get a much higher I.Q. than their intelligence warrants. Therefore, as with all tests for young children, we must remember that any individual test may not have good diagnostic value for a certain child, still the tendencies revealed by a large group are, it seems to me, very worth while knowing.

From a number of the cases which have been restudied the I.Q. seems more unstable than we would expect in later years. Two outstanding instances are of boys placed for adoption. One, tested while still in an institution, had an I.Q. of 79, while after one year, with all the opportunities of an excellent private home, the Binet score jumped to 99. Another child within two years had I.Q.'s of 120, 139, 179, 160. Although some of this fluctuation might have

been partly conditioned by the adjustment to a new foster home, it seems that the nature of the test material and the whimsicality of the pre-school age better explains it. It is not rare for a child to pass a test such as picture enumeration, the social comprehensions or definitions, and, a year later, fail to succeed with the same material. Counting four pennies and distinguishing between right and left are tests where chance plays a considerable part and therefore give unstable results.

Careful study of the percentage table of the number of two- and three-year-olds passing each test will show their order of difficulty. The most outstanding findings are the large number pointing to parts of the face and naming common objects and the great difficulty of copying a square.

The I.Q. distribution is interesting in that it shows that the two year group tends on the average to rank 7 points higher than the three year group. The only explanation for this seems to be that certain of the three year tests, as the table shows, are very easy, and for three-year-olds there are no tests at the higher points which are equally easy.

It might seem, especially for the three-year-olds, that this group was an inferior one since the median I.Q. was only 94. The general results from the performance tests did not give at all that impression. I believe the explanation is the number of foreign and social agency children in the study who do not have the stimulation along verbal lines which the upper social classes have, and since practically all the tests require language, the I.Q. would naturally be lower.

Validity of Diagnoses for Pre-School Ages

The question has very frequently been asked, how reliable is a diagnosis made on a baby? One naturally has a right to be cautious in accepting at 12 months or even 36 months a statement as to what scholastic and social success we can expect at 16 years. The only proof or reliability is through retests of the same individual. Fortunately, I was able to follow 142 children for periods ranging from one to four years, which meant that each case had at least two psychological examinations and some had as many as five. The results seem highly gratifying and are as follows:

	Results on Retest		
First exam. made,	*Same Rating*	*Higher Rating*	*Lower Rating*
68 cases, under 24 months	—50 cases or 74%	—15 cases or 22%	—3 cases or 4%
52 cases, from 24 to 36 months	—34 cases or 65%	—14 cases or 27%	—4 cases or 8%
22 cases, from 36 to 48 months	—20 cases or 90%	— 2 cases or 10%	—0 cases or 0%
142 cases (total)	73%	22%	5%

It is important to analyze the cases where the diagnosis varied on a retest. I should say in regard to the system of diagnoses used, that the children were classified as superior, above average, average, dull, doubtful and definitely feeble-minded. For practical purposes it does not seem needful to have a further divisioning and it is also doubtful how accurate we could be if we tried a finer refinement. Therefore when a case is diagnosed on a retest as "the same rating," it means that on two or more tests the same one of the six classifications was used to describe the child's capability.

For the total retested group, 73 per cent did not vary on restudy, and after 36 months 90 per cent of the diagnoses remained stable. This does show, as we would expect, that it is more possible to make accurate diagnoses the higher in the age scale we go.

Of the 22 per cent who tested better when examined the second time, the reasons were practically always explainable by one of three causes. Usually the improvement was due to a better established control of the emotions or better conformity to the test conditions. Especially with the children under three, as we have previously mentioned, there is often a timidity, self-consciousness or disinterest which negates our initial findings in certain individual cases and a retest corrects the first impression of ability. Another cause for hiding the real competency was the effect of lack of stimulation in the environment, such as is true with institution or neglected children. After more stimulating training, it is not unusual to get much better test responses. The third cause for mental improvement was a corresponding physical improvement.

The group who test poorer, when seen a second or third time, is, for the purpose of adoption protection, the most important. We can readily see how disastrous it is if a baby is placed for adoption on the basis of a mental examination and later this diagnosis proves to have been too hopeful. The factor which caused the variance in rating was almost uniformly language development. From the testing of older children we all know how frequently we find children who handle performance test well because they have good concrete ability, but who have poor verbal ability as evidenced by low Binet scores and also by slow academic progress, and therefore on a general diagnosis are rated below average. It was this type of child who on the initial examination seemed to be of better ability than later study proved. Their language being late in appearing or being inhibited before the examiner, the only basis of judgment was on the simple performance tests. When restudied at a later pe-

riod a language absence or inferiority had more serious significance and gave a poorer general picture than when they had been judged solely by concrete material. I might say that no child, however, was ever diagnosed as average and later fell into a very inferior group. The 7 cases whose ratings fell, were from above average to average, and from average to dull.

From these 142 retested children it seems therefore that our first judgment of a child, even though he be as young as one year, if made cautiously by well standardized tests, will in at least 95 per cent of the cases, be reliable enough to make placement for adoption a safe procedure. As a check against the small number who test poorer on a second examination, is the measure which careful psychologists will urge for all small children—that is, at least two mental test studies before legal adoption can be effected.

Another gratifying aspect of the reliability of diagnoses on young children was the many times the estimates of intelligence, which had been formed from the test responses, agreed with the opinion of ability held by nursery school teachers, trained nurses, and others who had the children under their daily care and observed their reactions to habit training, play ability and general adaptations.

Conclusions

1. Tests for pre-school children have an important place in the field of clinical psychology. The most vital application is in adoption studies, but their worth is also being realized by mental hygiene clinics and by pediatricians in medical circles.

2. From the study of some 650 children between the ages of one and four, selected from various racial nationality and economic groups, it has been possible to obtain norms which seem a good criteria for comparison of any individual pre-school child.

3. Too much emphasis cannot be laid on the caution needed in diagnosing an individual case, since emotional upset or disinterest in conforming to the test conditions can obscure the real competency much more than is the case with older children.

4. Performance tests make excellent material for the psychological study of small children as they so easily arouse the interest. For a complete evaluation of ability, they should, however, be supplemented by language tests. The battery of simple concrete tests standardized in this study should be a helpful part of the equipment for studying pre-school ability.

5. One hundred and forty-two cases restudied give a high reliability for the initial diagnosis. When tested later, 73 per cent classified in the same group, 22 per cent in a higher group and only 5 per cent in a lower group. This seems to show that by the careful use of standardized mental tests, the risk of adoption can be reduced to a very low degree.

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THREE FIGURE FORMBOARD
(594 Cases)

Age	1:4 1:5	1:6 1:7	1:8 1:9	1:10 1:11	2– 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3– 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles																
100	DNC	L	S	S	S	S	S	S	S	S	S	S	S	S	S	S
90	DNC	L	L	S	S	S	S	S	S	S	S	S	S	S	S	S
80	DNC	DNC	L	L	S	S	S	S	S	S	S	S	S	S	S	S
70	DNC	DNC	L	L	L	L	S	S	S	S	S	S	S	S	S	S
60	DNC	DNC	DNC	L	L	L	S	S	S	S	S	S	S	S	S	S
50	DNC	DNC	DNC	DNC	L	L	L	S	L	S	S	S	S	S	S	S
40	DNC	DNC	DNC	DNC	L	L	L	L	L	S	L	S	S	S	S	S
30	DNC	DNC	DNC	DNC	DNC	L	L	L	L	L	L	S	S	S	S	S
20	DNC	DNC	DNC	DNC	DNC	L	L	L	L	L	L	L	L	L	L	S
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	L	L	L	L	L	L	L
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	L	DNC	DNC	L	DNC
%S	0	0	3	11	24	29	33	51	38	63	51	79	71	68	77	91
%L	0	11	28	35	35	49	45	37	48	23	46	21	26	29	23	6
%DNC	100	89	69	54	41	22	22	12	14	14	3	0	3	3	0	3
No. of Cases	34	38	35	37	37	53	41	49	34	35	35	42	30	34	30	30

WITMER FORMBOARD
(478 Cases)
First Trial

Age	1:10–1:11	2–2:1	2:2–2:3	2:4–2:5	2:6–2:7	2:8–2:9	2:10–2:11	3–3:1	3:2–3:3	3:4–3:5	3:6–3:7	3:8–3:9	3:10–3:11
Deciles													
100	DNC	DNC	DNC	DNC	123	225	150	71	76	92	90	62	53
90	DNC	DNC	DNC	DNC	DNC	DNC	DNC	94	102	112	104	104	78
80	DNC	DNC	DNC	DNC	DNC	DNC	DNC	244	257	206	160	118	86
70	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	236	134	100
60	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	160	160
50	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	180	275
40	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
30	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
%S					8	9	6	20	22	29	38	50	50
%DNC	100	100	100	100	92	91	94	80	78	71	62	50	50

Best of 3 trials

Age	1:10 1:11	2– 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3– 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles													
100	201	DNC	75	122	79	63	77	51	46	57	57	53	39
90	DNC	DNC	DNC	DNC	DNC	94	93	67	66	92	77	65	53
80	DNC	DNC	DNC	DNC	DNC	195	115	83	107	105	99	78	57
70	DNC	DNC	DNC	DNC	DNC	DNC	177	115	128	120	103	96	65
60	DNC	DNC	DNC	DNC	DNC	DNC	246	152	137	137	117	102	77
50	DNC	DNC	DNC	DNC	DNC	DNC	274	169	150	175	142	108	81
40	DNC	DNC	DNC	DNC	DNC	DNC	DNC	189	157	DNC	216	115	98
30	DNC	DNC	DNC	DNC	DNC	DNC	DNC	274	DNC	DNC	300	133	115
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	160	121
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	215	217
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
%S	3		3	5	16	24	54	68	62	59	68	90	93
%DNC	97	100	97	95	84	76	46	32	38	41	32	10	7
No. of Cases	37	37	53	41	49	34	35	35	37	27	34	30	29

WALLIN PEGBOARD A
(614 Cases)
First Trial

Age	1–1:1	1:2–1:3	1:4–1:5	1:6–1:7	1:8–1:9	1:10–1:11	2–2:1	2:2–2:3	2:4–2:5	2:6–2:7	2:8–2:9	2:10–2:11	3–3:1	3:2–3:3	3:4–3:5	3:6–3:7	3:8–3:9	3:10–3:11
Deciles																		
100	60	63	43	30	22	22	17	15	17	14	13	13	12	12	12	13	12	11
90	DNC	DNC	48	33	26	23	21	20	19	17	19	15	13	13	14	14	12	13
80	DNC	DNC	82	36	33	27	23	21	21	18	20	17	15	14	15	16	13	13
70	DNC	DNC	110	40	36	28	26	23	23	19	20	18	15	16	15	16	14	14
60	DNC	DNC	DNC	58	41	30	27	26	24	20	21	21	17	17	17	17	15	14
50	F	DNC	DNC	68	54	33	31	29	28	22	22	22	19	20	19	17	16	15
40	F	DNC	DNC	86	70	45	32	31	29	23	24	24	21	21	20	19	18	15
30	F	DNC	DNC	115	110	48	35	39	32	24	24	26	24	25	20	20	20	15
20	F	F	DNC	180	135	65	43	44	34	32	26	26	25	28	22	22	20	17
10	F	F	F	DNC	DNC	127	109	50	49	41	49	34	29	34	27	29	23	27
0	F	F	F	F	DNC	DNC	DNC	69	55	90	98	56	36	49	30	34	26	29
%S	3	4	30	81	85	94	91	100	100	100	100	100	100	100	100	100	100	100
%DNC	40	65	53	13	15	6	9											
%F	57	31	17	6														

Best of 3 Trials

Age	1–1:1	1:2–1:3	1:4–1:5	1:6–1:7	1:8–1:9	1:10–1:11	2–2:1	2:2–2:3	2:4–2:5	2:6–2:7	2:8–2:9	2:10–2:11	3–3:1	3:2–3:3	3:4–3:5	3:6–3:7	3:8–3:9	3:10–3:11
Deciles																		
100	60	45	25	25	22	17	16	15	14	12	13	13	11	12	7	12	11	8
90	DNC	DNC	40	29	25	19	18	18	18	15	16	13	12	13	10	13	12	11
80	DNC	DNC	60	31	28	21	19	19	19	16	18	15	15	14	13	13	13	11
70	DNC	DNC	82	34	31	25	21	22	20	17	19	16	15	15	14	13	14	13
60	DNC	DNC	123	36	35	27	24	22	21	18	20	17	16	15	15	15	14	14
50	F	DNC	DNC	49	36	28	26	24	22	19	21	17	18	15	15	15	14	14
40	F	DNC	DNC	63	40	31	28	26	23	20	21	19	19	17	17	17	15	15
30	F	DNC	DNC	69	44	35	29	28	25	26	23	20	21	19	18	17	16	15
20	F	F	DNC	115	58	39	33	30	26	29	23	22	25	20	18	20	18	16
10	F	F	F	120	127	58	52	39	37	35	26	30	27	24	20	29	21	23
0	F	F	F	F	DNC	DNC	DNC	53	50	38	28	56	32	31	22	34	22	28
%S	3	4	40	88	91	97	94	100	100	100	100	100	100	100	100	100	100	100
%DNC	40	65	43	6	9	3	6											
%F	57	31	17	6														
No. of Cases	30	26	30	31	34	35	35	49	38	42	29	32	36	41	30	33	31	32

WALLIN PEGBOARD C
(528 Cases)

First Trial

Age	1:6 1:7	1:8 1:9	1:10 1:11	2: 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3: 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles															
100	DNC	119	28	23	17	19	16	21	15	15	15	17	15	15	12
90	DNC	DNC	77	35	41	39	26	27	29	18	19	19	18	17	14
80	DNC	DNC	DNC	126	67	115	34	41	30	25	24	22	22	18	15
70	DNC	DNC	DNC	DNC	90	DNC	45	95	52	27	26	23	23	20	18
60	DNC	DNC	DNC	DNC	DNC	DNC	57	118	85	35	32	25	30	23	21
50	DNC	DNC	DNC	DNC	DNC	DNC	98	DNC	160	37	35	26	43	30	23
40	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	80	50	46	56	35	34
30	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	123	90	DNC	93	82	43
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	134	150	85
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	150	DNC	DNC
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
%S		3	14	22	33	24	55	42	50	78	76	70	91	87	84
%DNC	100	97	86	78	67	76	45	58	50	22	24	30	9	13	16

Best of 3 Trials

Age	1:1 1:1	1:2 1:3	1:4 1:5	1:6 1:7	1:8 1:9	1:10 1:11	2: 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3: 3:1	3:2 3:2	3:4 3:5	3:6 3:7	38: 3:9	3:10 3:11
Deciles																		
100	DNC	DNC	45	25	33	20	21	18	17	13	13	15	13	13	12	14	11	11
90	F	DNC	98	37	35	24	24	22	23	19	18	18	14	15	13	14	13	13
80	F	DNC	DNC	77	47	25	29	23	28	20	20	18	16	16	14	15	13	13
70	F	F	DNC	89	60	40	30	27	32	22	21	19	20	18	17	16	15	14
60	F	F	DNC	123	75	43	32	29	33	22	24	22	21	19	18	17	17	15
50	F	F	F	DNC	94	45	39	31	38	23	27	24	23	20	19	20	20	15
40	F	F	F	DNC	123	76	47	41	43	26	31	26	25	20	19	21	21	17
30	F	F	F	DNC	150	80	52	46	49	29	35	29	29	23	20	24	21	19
20	F	F	F	F	DNC	DNC	70	55	50	38	36	31	31	25	21	25	23	20
10	F	F	F	F	DNC	DNC	170	69	63	52	45	40	36	29	25	32	29	23
0	F	F	F	F	F	F	F	DNC	DNC	DNC	DNC	49	50	42	29	98	38	30
%S			13	42	65	77	89	98	97	98	97	100	100	100	100	100	100	100
%DNC	6	23	29	35	26	12	2	2	3	2	3							
%F	94	77	58	23	9	11	9											
No. of Cases	31	26	31	31	34	35	35	49	38	42	29	32	36	41	30	32	31	32

WALLIN PEGBOARD B
(585 Cases)

First Trial

Age	1: 1:1	1:2 1:3	1:4 1:5	1:6 1:7	1:8 1:9	1:10 1:11	2: 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3: 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles																		
100	F	DNC	85	55	33	27	21	19	23	14	18	17	13	13	12	14	11	13
90	F	F	130	77	35	31	28	24	26	20	20	18	15	16	14	15	13	14
80	F	F	DNC	92	60	40	30	29	33	22	20	19	16	17	17	16	15	14
70	F	F	DNC	130	75	45	38	39	41	24	26	21	20	19	19	20	17	15
60	F	F	DNC	DNC	95	63	48	43	50	27	31	23	22	20	20	21	18	16
50	F	F	F	DNC	142	80	47	46	57	29	32	25	25	22	22	20	19	16
40	F	F	F	DNC	170	117	84	50	65	32	35	28	27	23	23	22	23	18
30	F	F	F	DNC	DNC	DNC	105	67	74	38	43	31	29	25	25	26	24	20
20	F	F	F	F	DNC	DNC	DNC	89	75	44	45	35	31	29	27	29	28	21
10	F	F	F	F	DNC	DNC	DNC	114	99	57	64	55	38	39	36	46	38	26
0	F	F	F	F	F	F	F	DNC	DNC	DNC	DNC	101	116	52	54	107	46	33
%S			13	32	59	63	77	96	95	98	97	100	100	100	100	100	100	100
%DNC		4	29	45	32	26	14	4	5	2	3							
%F	100	96	58	23	9	11	9											

Best Trial of at least 2 Successes

Age	1:6 1:7	1:8 1:9	1:10 1:11	2: 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3: 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles															
100	DNC	56	21	22	16	19	16	16	15	14	13	11	14	13	8
90	DNC	DNC	52	25	25	29	21	20	17	14	16	15	16	15	13
80	DNC	DNC	116	39	40	48	25	24	19	20	19	18	17	17	15
70	DNC	DNC	DNC	DNC	49	115	28	27	22	22	20	19	17	18	17
60	DNC	DNC	DNC	DNC	DNC	DNC	34	45	25	24	23	21	20	20	17
50	DNC	DNC	DNC	DNC	DNC	DNC	40	59	27	25	24	22	22	20	19
40	DNC	DNC	DNC	DNC	DNC	DNC	58	85	37	28	25	25	27	24	20
30	DNC	DNC	DNC	DNC	DNC	DNC	115	DNC	49	33	26	29	29	30	22
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	167	156	36	46	52	35	25
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	63	DNC	68	41	34
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	60	43
%S		3	23	25	40	34	74	62	84	84	93	90	97	100	100
%DNC	100	97	77	75	60	66	26	38	16	16	7	10	3		
No. of Cases	32	34	35	36	49	38	42	29	32	36	41	30	32	31	31

WALLIN PEGBOARD D
(492 Cases)

First Trial

Age	1:8 1:9	1:10 1:11	2 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles														
100	92	45	71	52	28	26	24	31	22	21	20	19	20	19
90	DNC	DNC	DNC	93	46	40	39	32	37	25	26	23	22	21
80	DNC	DNC	DNC	DNC	DNC	51	86	58	43	25	31	36	23	24
70	DNC	DNC	DNC	DNC	DNC	122	131	79	61	36	36	50	26	28
60	DNC	DNC	DNC	DNC	DNC	DNC	DNC	92	126	57	40	61	34	35
50	DNC	DNC	DNC	DNC	DNC	DNC	DNC	180	180	75	115	83	44	42
40	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	114	DNC	126	66	48
30	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	178	DNC	DNC	165	80
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
%S	3	9	6	17	11	38	31	59	51	73	57	65	80	75
%DNC	97	91	94	83	89	62	69	41	49	27	43	35	20	25

Best of 3 Trials

Age	1:8 1:9	1:10 1:11	2 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:8 2:9	2:10 2:11	3 3:1	3:2 3:3	3:4 3:5	3:6 3:7	3:8 3:9	3:10 3:11
Deciles														
100	92	34	38	26	28	22	23	20	15	19	20	19	16	15
90	DNC	90	DNC	46	46	25	25	26	23	23	24	20	18	18
80	DNC	DNC	DNC	60	93	32	35	31	25	25	26	23	19	19
70	DNC	DNC	DNC	DNC	DNC	36	45	35	31	29	29	27	21	21
60	DNC	DNC	DNC	DNC	DNC	50	104	43	36	37	32	31	23	22
50	DNC	DNC	DNC	DNC	DNC	87	DNC	58	41	43	40	38	27	23
40	DNC	DNC	DNC	DNC	DNC	165	DNC	92	88	50	63	40	29	27
30	DNC	DNC	DNC	DNC	DNC	DNC	DNC	125	120	61	108	58	38	35
20	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	89	DNC	DNC	56	40
10	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	48
0	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC	DNC
%S	3	11	6	29	19	60	45	75	71	90	74	79	90	91
%DNC	97	89	94	71	81	40	55	25	29	10	26	21	10	9
No. of Cases	34	35	35	48	37	42	29	32	35	40	30	34	30	31

COLOR MATCHING
(524 Cases)

Age	1:6 1:7	1:8 1:9	1:10 1:11	2 2:1	2:2 2:3	2:4 2:5	2:6 2:7	2:10 2:9	3 2:11	3:2 3:1	3:4 3:3	3:6 3:5	3:8 3:7	3:8 3:9	3:10 3:11
Deciles															
100	Y	Y	RY	RY	S	S	S	S	S	S	S	S	S	S	S
90	F	F	Y	RY	P	P	S	S	S	S	S	S	S	S	S
80	F	F	F	Y	Y	Y	P	P	P	S	S	S	S	S	S
70	F	F	F	F	F	Y	RY	P	P	P	S	P	S	S	S
60	F	F	F	F	F	F	RY	RY	P	P	P	P	S	S	S
50	F	F	F	F	F	F	Y	Y	RY	P	P	P	S	S	S
40	F	F	F	F	F	F	F	F	RY	RY	RY	RY	P	P	S
30	F	F	F	F	F	F	F	F	RY	Y	RY	Y	RY	P	P
20	F	F	F	F	F	F	F	F	RY	Y	RY	Y	Y	RY	RY
10	F	F	F	F	F	F	F	F	Y	F	Y	F	Y	RY	RY
0	F	F	F	F	F	F	F	F	F	F	F	F	F	Y	Y
%S	0	0	0	0	2	6	18	18	17	24	32	21	56	48	63
%P	0	0	0	0	11	9	21	29	44	51	51	50	63	69	83
%RY	0	0	5	8	16	15	42	43	87	64	81	64	69	93	97
%Y	3	3	8	19	18	29	56	54	93	82	89	75	88	100	100
%F	97	97	92	81	82	71	44	46	7	18	11	25	12	0	0
No. of Cases	38	33	37	37	44	34	34	28	30	33	37	28	33	29	30

S—6 Colors Matched (yellow, red, blue, green, orange, purple).
P—4 Colors Matched (yellow, red, blue, green).
RY—2 Colors Matched (yellow, red).
Y—1 Color Matched (yellow).
F—No colors Matched.